THE CHEMISTRY OF INOSITOL LIPIDS

BY
HENRY HIDEO TOMIZAWA
B.S., Iowa State College, 1949

AN ABSTRACT OF A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN CHEMISTRY
IN THE GRADUATE COLLEGE OF THE
UNIVERSITY OF ILLINOIS, 1952

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INTRODUCTION

The presence of inositol lipids in soybean was discovered by Klenk and Sakai in 1939 (1). Woolley (2), in 1943, isolated a purified inositol lipid fraction from soybean which he believed to be homogeneous. On the basis of degradation studies, he postulated that ethanolamine was the only nitrogenous component; however, this substance accounted for but 10 per cent of the total lipid nitrogen. Subsequently, the inositol lipid fraction has been shown to be a mixture.

In this laboratory, an extraction method has been developed for the isolation of a purified inositol lipid fraction (3, 4). The purpose of this investigation has been to separate homogeneous lipids and to identify the degradation products of this fraction.

DISCUSSION OF RESULTS

The above-mentioned procedure for the isolation of a purified inositol lipid fraction of plants has been adapted to the routine isolation of this material from corn phosphatides.

The separation of this fraction into those of greater homogeneity was achieved by extraction, chromatographic, and mild hydrolytic methods. Extraction of a hexane solution of the inositol lipid fraction with 95 per cent methanol yielded a hexane- and methanol-soluble material. Chromatographic procedures using silicic acid-Celite and Solka Floc as adsorbents also resulted in fractionations. Using the method of Schmidt and co-workers (5), mild alkaline hydrolysis of the lipid fraction yielded a material comparable to sphingomyelin. The various fractions isolated were analyzed for carbohydrates, both qualitatively and quantitatively, and for "sphingosine" (6)and "sphingomyelin" nitrogen, as well as for total nitrogen, phosphorus, and inositol. The presence of arabinose in the purified inositol lipid fraction of corn phosphatides was detected by the method of paper chromatography.

Upon vigorous alkaline hydrolysis of the inositol lipid fraction, a nitrogenous material was isolated which was insoluble in water and ether. This substance was believed to be a derivative of sphingosine or a related compound. Isolation and characterization of the long-chain base has proved the base to be identical with that of yeast cerebrin which was characterized by Reindel and co-workers in 1940 (7).

SUMMARY

A procedure for the isolation of purified inositol lipids of plants has been adapted to the routine isolation of these materials from corn phosphatides. Extraction, chromatographic, and mild hydrolytic methods were utilized in fractionating these lipids. Several analytical techniques have been adapted to the investigation of these fractions.

In a degradation study, a derivative of a long-chain base was isolated. The base proved to be identical with that of cerebrin, a material found in yeast and fungi. This is the first isolation of the base of cerebrin from higher plants.

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VITA

The author was born on February 12, 1926, in San Francisco, California. After being graduated in 1944 from Boulder High School in Boulder, Colorado, he attended the University of Colorado from 1944 to 1945. He then was enrolled at Iowa State College from 1945 to 1946. He served in the Army of the United States from 1946 to 1947. Upon discharge, he worked at Eastman Kodak Company in San Francisco, California, as control chemist, until his return to Iowa State College in the fall of 1947. After receiving his degree of Bachelor of Science in 1949, he entered the Graduate College of the University of Illinois where he held a research assistantship from September, 1949, to September, 1952.